

## WHAT IS CLAIMED IS:

1. A method of forming a contact in a semiconductor device, comprising the steps:  
forming a silicon substrate with a conductive region;  
forming a dielectric layer on the silicon substrate and a contact hole in the dielectric layer exposing at least a portion of the conductive region;  
depositing a refractory metal contact layer in the contact hold and on the conductive region portion;  
forming a silicide region by reacting the refractory metal contact layer with the conductive region portion;  
forming a contact barrier metal layer on the refractory metal contact layer; and  
plasma treating the contact barrier metal layer only after the forming of the silicide region.
2. The method of claim 1, wherein the refractory metal contact layer consists of titanium (Ti).
3. The method of claim 2, wherein the contact barrier metal layer consists of titanium nitride (TiN).
4. The method of claim 3, wherein the step of depositing a refractory metal contact layer and the step of forming a silicide region includes depositing the titanium at a temperature sufficient to cause the titanium to react with the conductive region portion to form silicide at the conductive region portion.
5. The method of claim 4, wherein the temperature is above 500°C.
6. The method of claim 4, wherein the temperature is above 600°C.
7. The method of claim 3, wherein the step of forming a silicide region includes performing an in-situ anneal at a temperature sufficient to cause the titanium to react with the conductive region portion to form silicide at the conductive region portion.

8. The method of claim 7, wherein the temperature is greater than 500°C.
9. The method of claim 7, wherein the temperature is greater than 600°C.
10. The method of claim 3, wherein the refractory metal contact layer is deposited to a thickness on the conductive region portion between about 40% to about 60% of a thickness of the silicide region formed by reacting the refractory metal contact layer with the conductive region portion.
11. The method of claim 3, wherein the step of depositing a refractory metal contact layer includes physical vapor deposition of the refractory metal contact layer.
12. The method of claim 11, wherein the step of forming a contact barrier metal layer includes metal organic chemical vapor deposition (MOCVD) of the contact barrier metal layer.
13. The method of claim 1, wherein the step of forming a contact barrier metal layer is performed prior to the step of forming a silicide region.
14. The method of claim 1, wherein the step of forming a contact barrier metal layer is performed after the step of forming a silicide region and before the step of plasma treating the contact barrier metal layer.
15. A method of forming a contact, comprising the steps:
  - depositing a refractory metal contact layer within a contact hole formed in a dielectric layer on a silicon substrate having a contact region exposed by the contact hole;
  - forming a contact barrier metal layer on the refractory metal contact layer without plasma treatment
  - forming silicide at the contact region; and
  - plasma treating the contact barrier metal layer after the forming of the silicide.

16. The method of claim 15, wherein the refractory metal contact layer consists of titanium and the contact barrier metal layer consists of titanium nitride.

17. The method of claim 16, wherein the silicide is formed with a thickness of  $x$ , and the refractory metal contact layer is deposited to a thickness on the contact region of between about  $.4x$  to about  $.6x$ .

18. The method of claim 17, wherein the depositing of the refractory metal contact layer and the forming of silicide at the contact region are performed simultaneously by depositing the refractory metal contact layer at a temperature sufficient to cause the titanium to react with the contact region.

19. The method of claim 18, wherein the method of forming silicide includes in-situ annealing after the depositing of the refractory metal contact layer, at an annealing temperature sufficient to cause the titanium to react with the contact region.